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ABSTRACT

The need for a new agenda for higher education is discussed. It is suggested that colleges need an informed vision of the kind of people needed to transform the economy. Higher education needs to ask whether late 19th-century models of education are appropriate for educating people for a 21st-century world of global competition. Five areas that colleges should be responsive to are as follows: the connection between research, technology, and productivity; what types of experts are needed; the connection between expertise and training in high school and college; the need for retraining adult workers; and the connection between higher education and the changing nature of work. Four directions that affect the level or kind of general preparation people need pertain to: the predominance of standard type industries; the rate of growth of science and technology; the effect of technology on the nature of the work force; and the changing characteristics of the work environment. These future prospects have implications for the education agenda, including the following: there is a need to produce substantial numbers of people who can turn regular industries into productive enterprises; managers and workers are needed who will promote technological change; and educational requirements must correspond to the need for technologically-literate workers. (SW)

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A COLLEGE EDUCATION UP TO BEATING THE JAPANESE

by Russ Edgerton

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Japan has become our new Sputnik. One can hardly pick up a magazine or newspaper without reading about the decline in America's economic position, and what might be done to restore our competitive edge.

It's instructive to remind ourselves, in the resulting debate, that higher education is not viewed by lawmakers as an end in itself. Colleges and universities have long been seen, appropriately in my view, as vehicles to achieve other national purposes: as places to help G.I.s readjust to a postwar world; as places to help minorities enter the mainstream of American life; or as institutions to train scientific manpower. Like it or not, our importance turns on the strength and reality of our connection to larger national priorities.

This being so, what we are looking at in the news stories is an immense opportunity – probably the single most important opportunity we will have in this decade, and perhaps the remainder of this century. The public is again aroused, and open to intelligent arguments about how higher education can contribute to a restored and reinvigorated economy.

This, of course, is not our only task. Every college and university must set its course on three basic points of reference. It must look inside, to its own history, traditions, and internal capabilities. It must look outside, to the changing nature of its students. And it must look outside to the changing nature of the society it is preparing these students to enter. Colleges differ in their internal capabilities and responsiveness to external needs. But not even the most internally focused, traditional liberal arts college lives in splendid isolation. It, too, must ask the question: how should we relate to this new opportunity?

Russ Edgerton has served as AAHE's president since 1977. He has taught political science at the University of Wisconsin-Madison, was assistant to the Secretary of H.E.W., and deputy director of the Fund for the Improvement of Postsecondary Education. This article is a revised version of a talk he gave to the 117th annual meeting of the Ohio College Association in April. These views are the first from an on-going study project, so comments from readers are especially welcome.

The Five Connections

I see five different connections, the first and most current of which might be dubbed "the R&D connection." From the beginning, the Reagan administration has seen the connection between research, technology, and productivity. Governors are vigorously trying to bring high-technology industry into their states; they sense the drawing power of research universities and other R&D assets. The only question here is whether higher education institutions other than universities can attract research and development projects.

Second, there's the "supplier of experts" connection. Like R&D, this link is crucial. *Global Stakes,* the recent book by James Botkin, Dan Dimancescu, and Ray Stata, lays out the data and arguments about this connection in succinct terms. It's hard to attend a conference without being told that Japan, with only about half our population, graduates more engineers than we do. Botkin et al point out that the U.S. has 20 lawyers for every 10,000 people while Japan has only one. (These numbers caused Frank Newman, at our recent national conference, to comment, "If we ever get Japan into court, we'll kill 'em.")

Third – and a corollary of the second – there is the "expertise/talent-pool" connection. The public understands that computer scientists develop from students who have received solid math and science training in high school and college. Now, concern over the general decline of SAT scores and other indicators of poor preparation in our elementary and secondary schools has sharpened the focus on the crisis of math/science achievement. Colleges can alleviate this problem both by taking steps to improve the quality of high school education and by shoring up their own programs in math and science.

Fourth, there is a "worker retraining" connection. We are told that by 1990, ten to fifteen million manufacturing workers, and at least as many service workers, will no longer be needed in the jobs they now have. With the baby-boom generation reaching maturity, far fewer people will be entering the labor force afresh. Eighty-five to ninety percent of the labor force of 1990 is *already* in place. These facts establish the parameters of an adult worker-retraining problem of immense proportions. This issue, too, looms large, although it is so complex that its definition is difficult to grasp. Within higher education, the community colleges and technical institutes are the main actors; many are energetically lobbying state legislatures and Congress to convert this connection into new training initiatives.

Fifth and finally, there is that elusive, more general connection between higher education and the changing nature of work. We are all familiar with the thesis that our society is in the midst of a profound structural transformation—a transformation on the same scale of importance as the shift from an agricultural to an industrial economy. For a long time, our best thinkers could only characterize this order in terms of what it was *not*—that is, as a "postindustrial" society. Now, building on the ideas of Fritz Machlup, Marc Porat, Daniel Bell, and others, we're beginning to refer to this new order as the "information society" in which information and knowledge are the key, strategic resource. Some now assert that to work productively and live successfully in such a society our citizens must achieve a new level and kind of general educational preparation. Let's call this the "general preparation" connection.

This last connection is the one I wish to address. Beyond general assertions that more education is needed for a more complex, information-based economy, we don't have the vital links in this connection in clear view. Is there a case for a new level and/or kind of general preparation? If so, and if this case were put forward in a compelling way, public support for higher education could potentially rise, helping all types of institutions. In particular, colleges and universities offering general and liberal education might contribute to our economic revitalization effort.

The New Economy

Suppose we put on our futurist cap and try to assess what's coming that will alter the level or kind of general preparation people need. To start, here are four directions.

With regard to high-technology industries, we've gone from slumber to media hype. The curtain may be lowering on the industrial age, but very slowly. The March 28 issue of *Business Week* offered a useful corrective to the widespread misperception about the high-technology sector. The Bureau of Labor Statistics defines a high-technology industry as one in which R&D expenditure and the number of technical employees are twice as high as the average for all manufacturing businesses. By this definition, of 977 industries assigned standard industrial codes, 36 qualify as high-technology industries. These include manufacturers of drugs, computers, and aircraft, and service industries such as computer programming and research laboratories. Fifty-six more are "high-tech intensive"—meaning their R&D budgets and technical employment figures are above the national average.

This high-technology sector is a relatively small part of the total economy. Its entire output is less than twice that of the automobile industry alone. In 1979, high-technology industries employed about three million workers—only three percent of the nation's non-agricultural work force. According to Data Resources Institute (DRI), this figure will climb to four percent by 1993.

This point leads to a second. If we look at the rate of expansion from an existing base, the percentage increases projected for occupations such as computer operators and programmers are striking. But remember, the base is small. The fact is, slower growing businesses with a much larger employment base will produce many more jobs in the next decade than will high-technology industries. Job categories expected to expand most include secretaries, nurses and nurse's aides, janitors, sales clerks, cashiers, truck drivers, fast-food workers, and waiters.

Even within high-technology industries, most of the new jobs will not be technical. According to DRI, engineers and technicians will account for fewer than one-third of the new employees.

None of this denies the importance of high technology. The point is that our challenge is not only to nurture new high-technology industries, but also to infuse technological knowledge and other productivity-enhancing ideas throughout the whole of the economy. The nontechnological sectors of our economy will still exist.

We have now built into our economy a scientific/technological dynamic which is awesome, and no one really knows where it is taking us. It is not easy to grasp the unprecedented role that science and technology now play in our lives, but perhaps a few concrete measures will help. One such measure is the size and scope of R&D enterprise. Approximately three million scientists and engineers are now at work around the world today, costing nearly $50 billion a year, with U.S. efforts accounting for about one-third of the total. Some believe that 90 percent of all the scientists who ever existed are living and working today, that 90 percent of all scientific knowledge has been generated in the last 30 years, and that the knowledge pool may double in the next 30 years. A recent National Academy of Sciences count revealed that two million scientific writings were being issued a year—that's 7,700 articles and reports each working day.

This enterprise will continue to grow, not only because it's now a vested interest, but also because of the logic of our new, international position. We can't sit by and watch the Japanese invest in a fifth-generation computer project without coming up with an equivalent effort of our own.

The exponential growth of scientific knowledge will, in turn, accelerate the pace of technological change. New generations of technological developments are coming on line in faster and faster sequence. One famous example is the development of the electronics industry. In the course of writing

The Micro-Millenium, Christopher Evans calculated where the automobile industry would be today if, since World War II, it had developed at the same rate as the computer industry. The answer: today a Rolls Royce would cost $2.75; it would get three million miles to the gallon; and it would deliver enough horsepower to drive the Queen Elizabeth II!

Technology seems to be splitting the work force into two tiers: an upper tier which requires more education, and a lower tier which requires less. This discovery surprised me; I had long assumed that the factory worker's daughter employed in an office had a better deal than her dad. I have been assuming that the general shift from blue-collar to white-collar work went hand in hand with an increase in job status, earnings, and the general level of education and training required.

But according to Eli Ginzberg, director of the Conservation of Human Resources project at Columbia University, two-thirds of the service jobs created since 1950 have been low-paying, high-turnover, part-time jobs—like those at McDonalds. Stable, goods-producing jobs earning $200 a week have been replaced by temporary service jobs earning $150. Economics writer Robert Samuelson reports in a recent *Washington Post* article that the Labor Department has quietly dropped the distinction between blue-collar and white-collar work. The reason: white collar jobs, now 52 percent of the labor force, no longer necessarily imply increased pay or status.

Most of us take for granted a simple kind of causal relationship between technology and an increased complexity of work which adds up to a need for more education and skills. For one tier of the work force, this appears to be true. More and more jobs seem to be like that of air traffic controller—involving sophisticated equipment and complex decision-making under high pressure.

Indeed, one gets an uneasy feeling that we are creating more work situations where people are not performing well. The consequences are scary. A case in point is the findings of the Kemeny Commission. John Kemeny, Dartmouth's eminent mathematician and former president, was asked to head an investigation on what happened at Three Mile Island. The commission found that human error on the part of the operators of the plant was the main cause of the failure. Yet the operators claimed they had never been trained for anything like the series of mishaps they confronted. The Kemeny Commission members examined the training programs, and found that the operators were right. They were trained for button pushing—for situations in which only one thing goes wrong; all theoretical background had been removed from the courses they took.

But the opposite also seems to be happening, and to larger numbers of people. As Henry M. Levin, director, and Russell W. Rumberger, senior research associate of the Institute for Research on Educational Finance and Governance at Stanford University, point out in a recent article, technology also leads to the mechanization of work tasks. These tasks can then be performed by workers with even fewer skills. We read about robots displacing factory workers, but a more subtle "deskilling" process is also going on across the service sector. Consider the clerk at the local supermarket. This clerk used to take pride in the efficiency with which he or she could calculate prices on your grocery items, ring them up on the cash register, make change, and chit-chat at the same time. Now the clerk drags your items across the window of the automatic inventory and checking machine, and hands you the change the machine commands. The manager in the back used to calculate inventories; central headquarters now does that job electronically.

In truth, no one really knows whether technology will create more interesting jobs than it destroys. Perhaps in the long run it will. But in this decade and into the next, we may be creating an expanding number of routinized jobs requiring little specific education or training. And such jobs no longer lead up to better jobs: the ladders of mobility are being removed. Beneath this unskilled tier lies the stagnate pool of the structurally unemployed, with the next generation increasingly urban and minority. Our picture of the future must include the ominous prospect of a new and growing underclass.

As important as the changing types of jobs are the changing characteristics of the work environment. *Human scale* is a term used to describe the components of a building in relation to the people who use it. But it is also a useful concept for thinking about the general relationship between individuals and their surrounding social, economic, and political arrangements. People develop a sense of security, self-worth, and efficacy as members of effective, human-scale communities—whether neighborhoods, business enterprises, or town meetings. As the scale of things increases, people lose the ability to comprehend and control the processes of decision-making that shape their lives. They become passive in the face of forces that seem impersonal.

"In this decade and into the next, we may be creating an expanding number of routinized jobs requiring little specific education or training. Such jobs no longer lead up to better jobs. . . ."

Until recently, all the trends pointed to bigger cities, bigger government, bigger business, bigger everything. "Going to work," for most people, has meant entering large, complex organizations where jobs are specialized and work is coordinated through layers of bureaucratic management. But these are environments, we're coming to see, where all the incentives are *against* taking initiative; "white-collar productivity" is now on the agenda as a problem.

A countertrend now seems underway. The small-is-beautiful movement is making some headway on a number of fronts. As to the economy in particular, David L. Burch, director of the Program on Neighborhood and Regional Change at MIT, reported recently that small and medium-sized firms are responsible for most of the new

jobs created in the past few years. The evidence is impressive. Between 1958 and 1963, firms with less than 100 employees grew only 3.9 percent, while firms with over 1,000 employees grew 13.7 percent. But then things turned around. Growth in the *Fortune* 1000 companies slowed, and the small firms took off. Between 1969 and 1976, firms with less than 20 employees generated 66 percent of the new growth in jobs. The dynamic force in the economy was not the corporate giant, but a few individuals starting their own companies.

The Education Agenda

I hope these four observations provide an accurate enough picture of the future to allow us to turn to the question: what, then, will people need to know and be able to do? Let me suggest some propositions.

- If smokestack industries are going to be with us for some time, then supplying experts for the high-technology sector is only a limited part of the emerging need. The broader need is to produce substantial numbers of people who can turn regular industries into productive enterprises.
- If productivity can be increased through the application of technology, then both managers and workers are needed who will promote technological change rather than resist it. We will need not only engineers, but large numbers of people who can think like engineers—people who are "technologically literate."
- If we need technologically literate workers, we have educational requirements that go beyond traditional supply/demand thinking about experts and shortages. Tony Carnevale, a Washington, D.C. consulting economist, contends that some countries in the Far East adopted such a philosophy long ago. They don't worry too much about how many job slots are available for particular kinds of specialists. They want people to have science and engineering backgrounds because they believe such individuals will transform the work situations they enter.
- If the pace of scientific and technological change accelerates, then the information and knowledge that U.S. college graduates imbibe is increasingly likely to be obsolete. It makes less and less sense to assume that any given body of knowledge is itself indispensable. The needed educational tools are those that mean learning how to learn.
- If air-traffic controllers and nuclear power plant operators are representative job types of the future, then for such jobs training of a mechanical kind (what Tony Carnevale calls "learning from the outside in") won't do. What these people need is *education* ("learning from the inside out"). They must have principles at their command by which to respond to a variety of situations.
- If the supermarket clerk represents another job category of the future, then the traditional education is of no occupational use at all. They need educations that give them the confidence to fight for better jobs, plus those capabilities which are the universal routes to mobility—those of self-expression and quantitative reasoning.
- If individuals are in danger of being engulfed in large, centralized bureaucracies, then they must have the self-confidence and organizational abilities to overcome these environments—to be entrepreneurs within them or to create new ones.

"If smokestack industries are going to be with us for some time, then supplying experts for the high-technology sector is only a limited part of the emerging need."

One might say that here we have an argument for the general and liberal educations we've been providing all along. But not quite. There *is* an argument here for the importance of a certain kind of general preparation, but not for the collegiate model that now exists.

If we go back over the learning propositions, certain themes emerge. First, call it character, courage, drive, self-confidence, gumption, risk-taking, or whatever, there is the theme of giving people the wherewithal to overcome and change the work situations they will enter. A second theme is the need for certain abilities such as communicating effectively, and sophisticated abilities such as thinking like an engineer. In third place—honorable mention as it were—is the recognized need for specialized knowledge and information.

Yet when we look at our colleges today, preparation in the first two crucial areas is barely on the agenda. Self-confidence, efficacy, and risk-taking develop as students participate in effective, working communities and engage in task-oriented activities. In some smaller, residential colleges and in experiential learning programs, I suspect these things still happen. But I doubt they happen often to students drifting from class to class in a university of 40,000. Sadly, the trends in recent years have been toward reducing the sense of engagement and involvement of students with their faculties and institutions.

In pre-Civil War years, colleges purposefully sought to instill a standard curriculum in students. Professors who taught the classical curriculum did not insist that their students know Greek and Latin to be "men of affairs;" Greek and Latin were the vehicles through which they taught mental discipline. To be sure, their view of mental discipline was a far cry from what we would now regard as the essentials, such as critical thinking. But these faculty did grasp a fundamentally important point: the subject was the means, not the end, of their teaching.

After the Civil War, with the rise of the professions and the emergence of the modern university, the means became the end. Professors pursuing specializations lost sight of the "process agenda" and came to view their role as imparting knowledge and information about their particular disciplines. The orthodoxy of the university, spread subsequently to liberal arts and community colleges, centers on the transmission of knowledge from professors to students. The implicit objective of most undergraduate programs is to turn out a student who knows a lot, who can retain great gobs of information. More and more information is crammed into courses, textbooks are larger, and both

courses and texts are subdivided into more and more specialties.

The New Agenda

To compete with the Japanese—or, even better, to pursue the other worthy ends of higher education—college administrators have to rethink the business they are in. Reading today's higher education journals and conference brochures, one finds a growing appreciation of the need for a new kind of literacy about computers, technology, and science; an awakened sense of the importance of foreign language and cross-cultural understanding in an interdependent world; and increasing discussion about certain abilities such as effective writing and critical thinking. But if we just add these concerns to the curriculum—what someone once called the barnacle strategy of educational change—we won't get far.

Given the challenge before us, it's time we asked whether late 19th-century models of education are up to the task of educating people for a 21st-century world of global competition. There's a lot of talk these days about raising expectations for performance; but the crucial question is, performance at what? If it's performance at retaining and recalling information, the gain won't be very great.

Yet there's a good alternative, and one desperately needed. That is to think hard about how we could revive some of our earliest curricular traditions, especially the development of character and reasoning abilities. We don't need more colleges trying to do what corporate training programs, professional societies, publishers, news networks, and other educating agencies already are doing, and doing often better than we can: transmitting information. Instead we need colleges that will assert their importance as counterweight institutions in a society which is "hyped up" on information of all kinds. Possessed with an informed vision of the kind of people needed to transform the economy into something better than it now is, colleges might turn out people who could take on the Japanese challenge, rather than succumb to it. ■